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"Does Matching Student and Teacher Racial/Ethnic Group Improve Math Scores?"

By:

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Abstract

We investigated whether students earn higher math test scores when they have a teacher whose racial/ethnic group is the same as their own. Using data from fourth-grade teachers and students in California, we computed individual-level regression equations that controlled for district differences and variations in teacher and student background characteristics. After adjusting for several student and teacher characteristics, only teaching experience showed a statistically significant correlation with student test scores. The other teacher characteristics we measured, including racial/ethnic group, did ***not*** tend to be related to student achievement. However, the pattern of coefficients lend some support to the hypothesis that white and other students score higher when they have teachers whose racial/ethnic group is the same as their own. In contrast, Hispanic and black examinees did not earn higher scores when they had teachers whose racial/ethnic group was the same as their own.

About two million new teachers will be needed in the next decade (National Commission on Teaching and America's Future, 1997). This demand stems from several factors, including increasing student enrollments (especially for minority groups), the trend toward smaller class sizes, and anticipated teacher retirements. Nevertheless, many states appear to be curtailing the supply of teachers as a result of their requiring more rigorous certification standards (Darling-Hammond, 2000). These higher standards—which are usually adopted in the hopes of improving the quality of teaching—often have an adverse impact on minority candidates (Cole, 1986; Ferguson, 1991). For example, the first-time passing rates of white, Asian, Hispanic, and black candidates on the basic skills test that California requires for all teachers were 80%, 60%, 47%, and 37%, respectively (Orrick, 1996). The same pattern holds in other states (Kirby et al., 1999).

These disparities in passing rates are particularly troubling to those who have striven to increase the presence of minority teachers in schools. One argument that is offered to support a greater presence is that minority teachers are generally more effective than white teachers with minority students. However, there is very limited empirical support for this thesis. For example, in a reanalysis of 1966 data from the *Equality of Educational Opportunity* study, Ehrenberg and Brewer (1995) found that after controlling for various teacher, school, and student characteristics, black high school students gained more when a higher percentage of their teachers were black. Studying the achievement of black elementary students, Murnane (1975) found that gains in math and reading were a quarter to one-half standard deviation higher with black teachers than with white teachers. In contrast, using data from the National Education Longitudinal Study of 1988, Ehrenberg, Goldhaber, and Brewer (1995) found that black and white teachers were equally effective with black students. Similarly, Alexander, Entwisle, and Thompson (1987) reported that black students in Baltimore performed equally well with black and white teachers. However, student scores and race interacted with their teacher's socioeconomic status (SES) and race. Low-SES black teachers were most effective in increasing black students' scores, whereas high-SES black teachers were the least effective.

Studies of the effect of the match between student and teacher racial/ethnic group on student test scores have been fraught with several serious limitations. For example, test scores from only one year were available in the *Equality of Educational Opportunity* data. Thus, Ehrenberg and Brewer could not control for prior achievement (and their study was based on data collected 35 years ago). Most of the prior studies have used the school (rather than the classroom) as the unit of analysis. Thus, they could not control for the racial/ethnic group of the student's own teacher, and their results are highly susceptible to aggregation bias.

Purpose

The study described below used data on fourth graders to examine the hypothesis that students earn higher math scores when they have a teacher whose racial/ethnic group is the same as their own. For example, all other things being equal, do black students receive higher scores if they have a black teacher than if they have a white or Hispanic or Asian teacher? We also explored whether student scores are related to their teacher's certification level and training in mathematics.

Methodology

We collected student and teacher information at a sample of 136 California elementary schools. These schools are in 11 districts that together contain about 20% of all the students in the state. The 281 fourth-grade teachers who participated in this study completed a survey that gathered data on their gender, racial/ethnic group, certification, highest degree received, coursework in mathematics, and years of teaching experience. For the 18 percent of students who were missing at least one prior year's test scores, we imputed values using student and teacher background variables.

To examine whether students do better if they have the same racial/ethnic group as their teachers, we computed individual-level regression equations that controlled for district differences and variations in teacher and student characteristics. For teachers, we controlled for gender, certification type, degree, mathematics coursework, and total years teaching. For students, we controlled for prior year math and reading scores, gender, home language, and whether the student participated in a gifted program, a special education program, and/or a free or reduced price lunch program. The dependent variable was 1999 Stanford 9 math scores. Standard errors were adjusted for the clustering of students within classrooms.

Results

Table 1 shows the distribution of teacher qualifications by teacher racial/ethnic group. In comparison to white teachers, black and Hispanic teachers had less teaching experience. However, black teachers were more likely to have a masters degree than were white teachers, and Hispanic teachers had slightly more math coursework than white teachers. White teachers were similar to "other" teachers with respect to credentials and years teaching, but white teachers had taken fewer math courses and were less likely to hold a higher degree.

Table 1

Distribution of Teacher Qualifications by Teacher Racial/Ethnic Group

Teacher's R/E Group	Percent with a				Average Number of	
	Math Credential	General Credential	No Credential	Masters Degree	Math Courses Taken	Years Teaching
White	4.6	91.9	8.1	32.5	4.2	3.2
Hispanic	6.3	65.6	34.4	34.4	5.2	2.5
Black	0	72.2	27.8	61.1	3.7	2.4
Other	0	88.2	11.8	55.9	5.5	2.9
Total	3.9	87.2	12.8	37.4	4.4	3.0

Note. Credential columns do not add to 100% because math credentials are a subset of general credentials.

Table 2 shows the number of teachers and students in each racial/ethnic group. The majority of the teachers were white, but most students were not. Table 3 shows that teachers were somewhat more likely to have students whose racial/ethnic group was the same as their own. This was particularly true of Hispanic teachers, who taught an average of 14 Hispanic students per class of 21 total students.

Table 2
Number of Students and Teachers by Racial/Ethnic (R/E) Group

Teacher's R/E Group	Student's R/E Group				Total
	White	Hispanic	Black	Other	
White (197)	2159	1398	493	862	4912
Hispanic (32)	128	452	40	43	663
Black (18)	64	142	147	54	407
Other (34)	206	270	78	279	833
Total (281)	2557	2262	758	1238	6815
% of all students	38%	33%	11%	18%	100%

Notes. Columns and rows correspond to students and teachers, respectively. The cells show the number of students taught. The number of teachers in each racial/ethnic group is shown in parenthesis. Most of the "others" are Asians.

Table 3
Average Number of Students Per Teacher as a Function of the Teacher's and Student's Racial/Ethnic (R/E) Group

Teacher's R/E Group	Student's R/E Group				Total
	White	Hispanic	Black	Other	
White	11	7	3	4	24.9
Hispanic	4	14	1	1	20.7
Black	4	8	8	3	22.6
Other	6	8	2	8	24.5

Note. Row totals differ from the sum of the cells in a row due to rounding.

We constructed two sets of regression analyses with four equations per set. One set contained a dummy variable for whether the student's teacher was white or not. The other set contained three dummy variables per equation corresponding to whether the student's teacher was black, Hispanic, or other non-white. Within each set we constructed separate equations for white, black, Hispanic, and other students. Thus, we constructed a total of eight equations.

Table 4 shows the R^2 values for equations with and without teacher race. Including teacher race in the regression model resulted in virtually no increase in R^2,

which suggests that at best, teacher race bears only a weak relationship to student achievement.

Table 4
R^2 Values for Regression Models With and Without Teacher Race

Regression Model	Student's R/E Group			
	White	Hispanic	Black	Other
Teacher race excluded	.646	.633	.651	.720
Dummy variable for white versus non-white teacher	.647	.633	.654	.720
Dummy variable for minority teachers	.647	.634	.653	.722

Table 5 shows the effect sizes of teacher race on student achievement for each combination of student and teacher racial/ethnic group. There was some evidence that minority teachers were, on average, less effective than white teachers. Black students performed significantly better with white teachers than with minority teachers. Although the result was not statistically significant, white students also scored higher with white teachers than teachers of another race. Hispanic examinees tended to score lower with "other" and black teachers, but Hispanic teachers were as effective as white teachers in teaching Hispanic students. "Other" students performed better with "other" and Hispanic teachers than with white teachers. However, "other" examinees with black teachers scored lower than "other" examinees with white instructors.

Table 5
Effect Size of Teacher Race on Student Achievement

Teacher's R/E Group	Student's R/E Group			
	White	Hispanic	Black	Other
White	.104	.019	.124 *	-.036
Hispanic	-.051	.018	-.170	.055
Black	-.127	-.090	-.098	-.175
Other	-.094	-.037	-.148	.093

Notes. Minority teachers serve as the reference group for the first row. White teachers serve as the reference group for the last three rows.
* Significant at .05 level.

Appendix A shows the eight regression equations. These data indicate that after controlling on other factors, participation in a gifted program was positively related to scores in every racial/ethnic group except blacks. Similarly, black females scored significantly higher than black males, but there were no gender differences within any of the other racial/ethnic groups. Within whites, special education examinees demonstrated poorer performance than non-special education examinees, but special education students of another race/ethnicity performed as well as their counterparts.

Teaching experience was the only teacher variable that was significantly correlated with student achievement across all students' racial/ethnic groups. General credentials were positively related to outcomes for white students, but were unassociated with scores for examinees of another race/ethnicity. Other teacher characteristics studied (gender, degree, math credentials, and math coursework) were also unrelated to student performance.

Because there were few teachers in some cells, the small sample size may have made it difficult to observe statistically significant results. Thus, we also examined the pattern of coefficients. This analysis suggested that "other" students (mostly Asians) tended to perform slightly better with "other" teachers than with white teachers, and white students tended to do better with white teachers than with teachers of another racial/ethnic group. However, having a teacher of the same race did not make a difference for Hispanic or black examinees. Hispanic students scored equally well with Hispanic and white teachers, and black students actually scored higher when their teachers were white teachers than when they were black.

Discussion

After controlling for several student and teacher background characteristics, only teaching experience showed a statistically significant correlation with student test scores. The other teacher characteristics that we measured, including racial/ethnic group, tended to be unrelated to student achievement. However, the pattern of coefficients lend some weak support to the hypothesis that white and "other" students score higher when they have teachers whose racial/ethnic group is the same as their own. In contrast, Hispanic and black examinees did not perform better when they had teachers whose racial/ethnic group was the same as their own.

Although the present study did not find a statistically significant effect of matching student and teacher racial/ethnic groups, there may be other compelling reasons for increasing the presence of minority teachers. For example, previous research has shown that teachers give higher subjective evaluations to students of the same race/ethnicity (Ehrenberg, Goldhaber, & Brewer, 1995), and students have lower rates of absenteeism when their teachers' race/ethnicity match their own (Farkas, Grobe, Sheehan, & Shuan, 1990). Minority teachers may also serve as role models for, have more favorable attitudes toward, and hold higher expectations for minority students than do white teachers. Furthermore, the finding that as a group, minority teachers are as effective as white teachers may help alleviate the concerns of some white parents about school policies that seek to hire more minority teachers.

The lack of significant relationships, particularly between many teacher qualifications and outcomes, may stem from student achievement being related to factors that we did not measure, such as the teacher's expertise in mathematics and reading (see Ferguson, 1991). Although the study included a rough proxy for mathematical proficiency (namely, the number of math courses taken), more refined measures, such as scores on a teacher certification test, may be needed.

Study Limitations

There are several caveats that need to be considered when interpreting the results of this study. First, the teachers and students who participated in this study are not representative of others in the state. Consequently, the relationships (or lack thereof) that

were found in this research cannot be generalized beyond our sample of students, teachers, and schools.

Our study is also limited by the small numbers of minority teachers. Fewer than 100 teachers in our sample are black, Hispanic, or "other." Moreover, additional research needs to be conducted in subject areas other than math. Minority teachers, particularly Hispanic teachers, may be more effective in other contexts, such as language or reading.

Finally, because we did not use an experimental design, we cannot be certain how self-selection effects influence the results. It is possible, for example, that minority teachers are more likely to be assigned to schools with a large minority student enrollment. We attempted to control for this effect by exploring models that took into account the percent minorities within a school. The results remained unchanged. However, our present data do not allow us to account for other kinds of self-selection effects. More studies are needed to determine how self-selection effects can modify our interpretations.

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Appendix A
Equation with Dummy Variables for White versus Non-White Teachers

Model A-1, White Students

VARIABLES	BETA	SE_BETA	T	P_VALUE
Intercept	-0.3842	0.1290	-2.9791	0.0032
District 1	0.1637	0.1007	1.6254	0.1055
District 2	0.2268	0.1475	1.5372	0.1256
District 3	0.2433	0.1041	2.3370	0.0203
District 4	0.2969	0.1025	2.8964	0.0041
District 5	0.4480	0.1271	3.5254	0.0005
District 6	0.0759	0.0956	0.7935	0.4283
District 7	0.2057	0.1172	1.7548	0.0806
District 8	0.2134	0.1093	1.9533	0.0520
District 9	0.1621	0.1068	1.5180	0.1304
District 10	0.1119	0.0899	1.2442	0.2147
Math courses	0.0094	0.0247	0.3818	0.7030
Masters	-0.0261	0.0461	-0.5666	0.5715
General credentials	0.1842	0.0851	2.1633	0.0316
Math credentials	0.0577	0.1273	0.4530	0.6510
Years teaching	0.0474	0.0216	2.2003	0.0288
Female teacher	0.1084	0.0650	1.6676	0.0968
White teacher	0.1040	0.0623	-1.6696	0.0964
Female student	0.0284	0.0256	1.1092	0.2685
GATE student	0.1487	0.0459	3.2406	0.0014
LEP student	-0.0030	0.0604	-0.0490	0.9609
Special education student	-0.1242	0.0535	-2.3238	0.0210
Reduced lunch student	-0.0494	0.0357	-1.3862	0.1671
1998 Math score	0.5663	0.0242	23.3675	0.0000
1998 Reading score	0.2052	0.0231	8.8825	0.0000

$R^2 = .647$

$N = 2557$

Equation with Dummy Variables for White versus Non-White Teachers

Model A-2, Hispanic Students

VARIABLES	BETA	SE_BETA	T	P_VALUE
Intercept	-0.2565	0.1214	-2.1124	0.0356
District 1	0.3167	0.0990	3.2006	0.0015
District 2	0.1175	0.0982	1.1958	0.2329
District 3	0.2378	0.1198	1.9858	0.0481
District 4	0.4414	0.1323	3.3376	0.0010
District 5	0.3069	0.1036	2.9624	0.0033
District 6	0.2575	0.1024	2.5148	0.0125
District 7	0.1499	0.1207	1.2416	0.2155
District 8	0.2530	0.1024	2.4705	0.0141
District 9	0.2194	0.0962	2.2811	0.0233
District 10	0.2626	0.1137	2.3091	0.0217
Math courses	0.0154	0.0204	0.7557	0.4505
Masters	-0.0290	0.0476	-0.6092	0.5429
General credentials	-0.0804	0.0787	-1.0212	0.3081
Math credentials	-0.0246	0.1390	-0.1769	0.8597
Years teaching	0.0893	0.0242	3.6895	0.0003
Female teacher	0.0774	0.0489	1.5829	0.1147
White teacher	0.0189	0.0483	-0.3906	0.6964
Female student	0.0161	0.0229	0.7038	0.4822
GATE student	0.3324	0.0576	5.7705	0.0000
LEP student	-0.0474	0.0317	-1.4946	0.1362
Special education student	-0.1183	0.0603	-1.9629	0.0507
Reduced lunch student	0.0308	0.0360	0.8578	0.3921
1998 Math score	0.5430	0.0269	20.1664	0.0000
1998 Reading score	0.2363	0.0284	8.3149	0.0000

$R^2 = .633$

$N = 2262$

Equation with Dummy Variables for White versus Non-White Teachers

Model A-3, Black Students

VARIABLES	BETA	SE_BETA	T	P_VALUE
Intercept	-0.1566	0.2024	-0.7735	0.4402
District 1	0.2705	0.1852	1.4603	0.1459
District 2	0.0920	0.1682	0.5467	0.5852
District 3	0.0078	0.1813	0.0430	0.9658
District 4	0.1765	0.2278	0.7751	0.4393
District 5	0.2934	0.1726	1.7004	0.0908
District 6	0.0504	0.1696	0.2971	0.7667
District 7	-0.0450	0.1795	-0.2509	0.8022
District 8	0.1670	0.1978	0.8443	0.3996
District 9	0.0406	0.2204	0.1841	0.8542
District 10	0.0852	0.1907	0.4466	0.6557
Math courses	0.0075	0.0343	0.2190	0.8269
Masters	-0.1019	0.0704	-1.4470	0.1496
General credentials	-0.1007	0.1125	-0.8950	0.3720
Math credentials	0.0399	0.2499	0.1597	0.8733
Years teaching	0.0981	0.0401	2.4468	0.0154
Female teacher	0.1101	0.0897	1.2270	0.2214
White teacher	0.1240	0.0626	-1.9806	0.0492
Female student	0.0961	0.0404	2.3802	0.0184
GATE student	0.1493	0.1298	1.1503	0.2515
LEP student	-0.3716	0.1985	-1.8722	0.0628
Special education student	-0.0329	0.1293	-0.2541	0.7997
Reduced lunch student	-0.0756	0.0544	-1.3913	0.1659
1998 Math score	0.5975	0.0467	12.8059	0.0000
1998 Reading score	0.1819	0.0487	3.7323	0.0003

$R^2 = .654$
$N = 758$

Equation with Dummy Variables for White versus Non-White Teachers

Model A-4, "Other" Students

VARIABLES	BETA	SE_BETA	T	P_VALUE
Intercept	-0.2029	0.1986	-1.0213	0.3083
District 1	0.2621	0.1570	1.6692	0.0966
District 2	0.1381	0.1060	1.3029	0.1940
District 3	0.3771	0.1131	3.3343	0.0010
District 4	0.5362	0.1066	5.0285	0.0000
District 5	0.2992	0.1321	2.2653	0.0245
District 6	0.2434	0.0849	2.8667	0.0046
District 7	0.3793	0.1252	3.0283	0.0028
District 8	0.4035	0.1509	2.6742	0.0081
District 9	0.3473	0.1067	3.2535	0.0013
District 10	0.2675	0.1016	2.6323	0.0091
Math courses	0.0256	0.0345	0.7420	0.4589
Masters	-0.0218	0.0609	-0.3576	0.7210
General credentials	0.0286	0.1633	0.1751	0.8612
Math credentials	-0.1399	0.1947	-0.7189	0.4730
Years teaching	0.0791	0.0354	2.2330	0.0266
Female teacher	-0.1128	0.0746	-1.5111	0.1323
White teacher	-0.0363	0.0710	0.5106	0.6102
Female student	0.0389	0.0324	1.2008	0.2312
GATE student	0.2356	0.0544	1.3307	0.0000
LEP student	0.0437	0.0508	0.8605	0.3905
Special education student	-0.0975	0.0931	-1.0477	0.2960
Reduced lunch student	-0.0102	0.0432	-0.2350	0.8144
1998 Math score	0.6668	0.0284	23.4737	0.0000
1998 Reading score	0.1307	0.0293	4.4646	0.0000

$R^2 = .720$

$N = 1238$

Equation with Dummy Variables for Minority Teachers

Model A-5, White Students

VARIABLES	BETA	SE_BETA	T	P_VALUE
Intercept	-0.2829	0.1471	-1.9231	0.0557
District 1	0.1575	0.0987	1.5951	0.1120
District 2	0.1982	0.1434	1.3821	0.1683
District 3	0.2116	0.1003	2.1085	0.0360
District 4	0.2858	0.1011	2.8273	0.0051
District 5	0.3945	0.1211	3.2560	0.0013
District 6	0.0816	0.0930	0.8770	0.3814
District 7	0.2414	0.1142	2.1135	0.0356
District 8	0.2176	0.1034	2.1049	0.0364
District 9	0.1642	0.1028	1.5969	0.1116
District 10	0.1184	0.0889	1.3325	0.1840
Math courses	0.0167	0.0269	0.6203	0.5357
Masters	-0.0199	0.0433	-0.4592	0.6465
General credentials	0.0876	0.1220	0.7175	0.4738
Math credentials	-0.0661	0.1570	-0.4208	0.6743
Years teaching	0.0538	0.0223	2.4091	0.0168
Female teacher	0.1006	0.0638	1.5769	0.1162
Hispanic teacher	-0.0507	0.1445	-0.3511	0.7259
Black teacher	-0.1268	0.1113	-1.1395	0.2557
"Other" teacher	-0.0937	0.0525	-1.7848	0.0756
Female student	0.0187	0.0238	0.7864	0.4324
GATE student	0.1432	0.0423	3.3880	0.0008
LEP student	0.0999	0.0561	1.7804	0.0763
Special education student	-0.1262	0.0526	-2.4016	0.0171
Reduced lunch student	-0.0473	0.0324	-1.4585	0.1460
1998 Math score	0.5699	0.0225	25.2916	0.0000
1998 Reading score	0.2070	0.0224	9.2348	0.0000

$R^2 = .647$

$N = 2557$

Equation with Dummy Variables for Minority Teachers

Model A-6, Hispanic Students

VARIABLES	BETA	SE_BETA	T	P_VALUE
Intercept	-0.2574	0.1205	-2.1359	0.0336
District 1	0.3199	0.1005	3.1826	0.0016
District 2	0.1189	0.0995	1.1951	0.2331
District 3	0.2443	0.1199	2.0372	0.0426
District 4	0.4430	0.1329	3.3335	0.0010
District 5	0.3222	0.1077	2.9925	0.0030
District 6	0.2615	0.1039	2.5176	0.0124
District 7	0.1410	0.1207	1.1681	0.2438
District 8	0.2653	0.1073	2.4722	0.0141
District 9	0.2182	0.0972	2.2440	0.0257
District 10	0.2670	0.1145	2.3325	0.0204
Math courses	0.0126	0.0232	0.5435	0.5873
Masters	-0.0285	0.0477	-0.5974	0.5507
General credentials	-0.0830	0.0770	-1.0776	0.2822
Math credentials	-0.0345	0.1404	-0.2457	0.8061
Years teaching	0.0878	0.0248	3.5389	0.0005
Female teacher	0.0779	0.0490	1.5895	0.1131
Hispanic teacher	0.0182	0.0562	0.3230	0.7469
Black teacher	-0.0899	0.0804	-1.1188	0.2642
"Other" teacher	-0.0373	0.0966	-0.3865	0.6994
Female student	0.0164	0.0231	0.7105	0.4780
GATE student	0.3278	0.0585	5.6064	0.0000
LEP student	-0.0536	0.0328	-1.6337	0.1035
Special education student	-0.1160	0.0612	-1.8971	0.0589
Reduced lunch student	0.0337	0.0360	0.9359	0.3505
1998 Math score	0.5457	0.0271	20.1175	0.0000
1998 Reading score	0.2368	0.0284	8.3312	0.0000

$R^2 = .634$
N = 2262

Equation with Dummy Variables for Minority Teachers

Model A-7, Black Students

VARIABLES	BETA	SE_BETA	T	P_VALUE
Intercept	-0.1484	0.2045	-0.7255	0.4691
District 1	0.2791	01857	1.5026	0.1347
District 2	0.0887	0.1689	0.5252	0.6001
District 3	0.0104	0.1809	0.0576	0.9541
District 4	0.1755	0.2266	0.7745	0.4397
District 5	0.2781	0.1733	1.6051	0.1102
District 6	0.0518	0.1697	0.3051	0.7606
District 7	-0.0475	0.1783	-0.2664	0.7902
District 8	0.1618	0.1984	0.8154	0.4159
District 9	0.0464	0.2215	0.2096	0.8342
District 10	0.0837	0.1904	0.4398	0.6606
Math courses	0.0162	0.0388	0.4179	0.6765
Masters	-0.1076	0.0725	-1.4838	0.1396
General credentials	-0.1123	0.1215	-0.9247	0.3564
Math credentials	0.0341	0.2496	0.1364	0.8917
Years teaching	0.0994	0.0404	2.4625	0.0147
Female teacher	0.1193	0.0912	1.3086	0.1923
Hispanic teacher	-0.1698	0.0996	-1.7051	0.0899
Black teacher	-0.0975	0.0803	-1.2141	0.2263
"Other" teacher	-0.1476	0.0982	-1.5038	0.1344
Female student	0.0963	0.0405	2.3775	0.0185
GATE student	0.1484	0.1293	1.1474	0.2527
LEP student	-0.3617	0.1980	-1.8269	0.0694
Special education student	-0.0286	0.1296	-0.2204	0.8258
Reduced lunch student	-0.0743	0.0543	-1.3677	0.1731
1998 Math score	0.5977	0.0468	12.7702	0.0000
1998 Reading score	0.1822	0.0489	3.7246	0.0003

$R^2 = .653$
$N = 758$

Equation with Dummy Variables for Minority Teachers

Model A-8, "Other" Students

VARIABLES	BETA	SE_BETA	T	P_VALUE
Intercept	-0.1738	0.1938	-0.8970	0.3707
District 1	0.2521	0.1587	1.5889	0.1136
District 2	0.1321	0.1048	1.2601	0.2090
District 3	0.3981	0.1104	3.6066	0.0004
District 4	0.5341	0.1068	5.0011	0.0000
District 5	0.3193	0.1307	2.4439	0.0154
District 6	0.2347	0.0848	2.7684	0.0061
District 7	0.3530	0.1242	2.8430	0.0049
District 8	0.4664	0.1528	3.0525	0.0026
District 9	0.3300	0.1048	3.1497	0.0019
District 10	0.2638	0.1000	2.6393	0.0089
Math courses	0.0145	0.0343	0.4223	0.6732
Masters	-0.0281	0.0590	-0.4772	0.6337
General credentials	-0.0008	0.1600	-0.0052	0.9958
Math credentials	-0.1721	0.1862	-0.9246	0.3563
Years teaching	0.0717	0.0347	2.0644	0.0402
Female teacher	-0.1111	0.0726	-1.5295	0.1276
Hispanic teacher	0.0547	0.1529	0.3578	0.7209
Black teacher	-0.1753	0.1292	-1.3573	0.1761
"Other" teacher	0.0926	0.0813	1.1385	0.2562
Female student	0.0381	0.0324	1.1768	0.2406
GATE student	0.2417	0.0544	4.4420	0.0000
LEP student	0.0441	0.0504	0.8737	0.3833
Special education student	-0.0911	0.0934	-0.9754	0.3305
Reduced lunch student	-0.0097	0.0427	-0.2261	0.8214
1998 Math score	0.6669	0.0283	23.5697	0.0000
1998 Reading score	0.1314	0.0293	4.4929	0.0000

$R^2 = .722$

$N = 1238$